Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTES AND LITERATURE

THE CAUSATION OF SEX[1]

THIS book is the work of a general practitioner of medicine. For twenty years he has collected clinical facts and materials upon which he now claims to have built up a new theory of sex. The theory has been put to the test in forecasting the sex of the unborn child and proved adequate in 97 per cent. of cases. The cause of sex being known in man, the determination of sex is readily accomplished. A summary disposition of Schenk's once-famous superior-vigor-theory is made by simply citing the clinical fact of the occasional simultaneous birth of both a boy and a girl.

The theory dissociates absolutely the male parent from any influence in sex causation—thus differing from several otherwise closely similar hypotheses. It is simply that "sex depends upon which ovary supplies the ovum fertilized." The clinical materials employed in proof are: (1) Sexually differing families; (2) extra-uterine pregnancy; (3) pregnancy in double uteri; (4) multiple pregnancy; (5) migration of ovum (internal and external; (6) preponderance of male over female births. Furthermore, the author denies validity to all arguments, respecting sex in man, from analogy with invertebrates or even lower vertebrates, believing "women not analogous to any living thing."

Respecting the anatomy and physiology of the female generative organs the following facts are noted and employed in the construction of the theory: (1) Lower position in pelvis of right ovary and internal opening of right oviduct; (2) larger caliber of right oviduct; (3) larger size of right ovary; (4) occasional presence of two ova in a Graafian follicle; (5) recorded cases of double nuclei in the mammalian egg; (6) corpus luteum as indicator of ovary from which the impregnated ovum came; (7) dependence on common cause, consequently close coincidence, of ovulation and menstruation (proof: scars of corpora lutea correspond to the number of menstrual periods experienced). The

[1] "The Causation of Sex," by E. Rumley Dawson, London, H. K. Lewis, 1909, pp. 190, 21 illustrations.

foregoing statements are supported mainly by quotations from various recognized authorities.

Chapters 3 and 5, dealing with the Formation of the Ova and Fertilization respectively, are vulnerable at various points to the criticisms of gratuitous assumption, specious reasoning and flagrant disregard of recent biological advance, more particularly respecting the questions of heredity and sex. Absolutely no notice is taken of the work of Bateson, Davenport and Castle on Mendelian inheritance, nor of the cytological and experimental results concerning the determination of sex respectively of Wilson and Correns. But however scant the appreciation of the bearing of results from non-human materials on the general problem, and however radical the ideas here expressed, the theory as such remains essentially unaffected.

In chapter 3 it is urged that "Each ovum has its own definite and unalterable sex, being either male or female according to the ovary from which it is derived." Though microscopic evidence of such difference is not yet forthcoming it is asserted to obtain "just as between the eggs of two different women." "Similarly the ovum of a negress is indistinguishable by our present appliances from the ovum of a blonde, yet we know full well that if fertilized one produces a black child while the other gives rise to a white one" (p. 29). Assuming, as this line of reasoning does, that there is identity (or at least close similarity) between the process of sex-inheritance and color-inheritance, both would seem to be due, in a large measure, to the influence of the male. For the ovum of a negress fertilized by the spermatozoon of a blonde male might give rise to a black child, but it would more likely be a mulatto, perhaps almost indistinguishable from a blonde—similarly sex may be influenced or determined by the spermatozoon.

Identity in the mechanism of heredity, whether it concern sex, color or other unit characters, is widely accepted; but Dr. Dawson seems to posit such identity or the absence of it depending upon the conclusion he desires to reach. Above he posits identity; but he reasons incorrectly in an attempt to reach a desired conclusion.

In a later chapter (chapter 5), starting with the assumption that the "provision in the human ovum of multiple avenues of entrance (the radiating pores of the zona pellucida) looks as though multiple spermatozoa are required to enter thereby in order to fertilize the human ovum," he argues that the "differ-

ent number of paternal and maternal features and characteristics inherited by the respective children must be due to a varying quantity of the paternal body or germ-plasm carried to each ovum fertilized by the varying number of spermatozoa" (100 or more). He argues for the necessity in human fertilization of multiple spermatozoa on the basis of (1) prolific supply at each ejaculation (200,000,000—Lode); (2) very frequent renewal; (3) long life in oviduct. According to this argument the color of the child resulting from the development of the egg of a blonde fertilized by the spermatozoon of a negro would be blonde if only one sperm entered, black if many entered—the direct contrary of his former position.

Again, the author holds that there is no question of heredity or "the exhibiting of ancestral tendencies or peculiarities in a varying degree" among the invertebrates! All that is necessary here at fertilization is to provide stimulus to development; consequently one spermatozoon will do. Even among cod or herring one sperm is held to be sufficient for the same reason. The number of spermatozoa demanded for the expression of any particular degree of inheritance is believed to be indicated by the number of micropyles in the egg. If always only one, or the same number of spermatozoa, entered the human ovum there could be no such thing as somatic variation. Evidently our author knows little of the later studies on the nature of fertilization and the function of the chromosomes in relation to sex and general inheritance. It is stated that "many spermatozoa entering the ovum lead to a father-like child whether boy or girl; a few only entering leave the yolk still maternally superior or prepotent so that the child whether boy or girl takes after the mother" because it is too much to ask of a single chance spermatozoon "besides fertilizing the ovum nucleus, also . . . to settle the sex of the coming child and likewise impart to the oosperm the form and face, talents and tendencies, coloration of hair, skin and eyes, movements and mannerisms, and even diseases of the father" (p. 42). And yet by the hypothesis that in the chromosomes of a single spermatozoon reside such potency can be explained the various phenomena of Mendelian inheritance —moreover, characters can be added and subtracted in accord with this theory. How could the phenomenon of color dominance in mice and guinea-pigs be explained on Dawson's assumption? Of course he will always reply that there is no

analogy between heredity in guinea-pigs and the human female. Evidently he has not yet accepted even the fact of evolution.

Absolute identity of the process of fertilization is asserted to be disproved by the results of merogony. The connection is obscure, but if the findings of Boveri and Delage in echinoderms have any bearing on the matter it would be to show that a single spermatozoon is prepotent over the greater extranuclear mass of the ovum and determines an organism with male characteristics.

Similar examples of loose reasoning and unwarranted statement appear in chapter 6. Here it is said that it is "reasonable to suppose that the association of the left ovary with the production of the female sex is due to the fact that the weaker sex should result from the weaker side of the body." How will Dr. Dawson prove that the female is the weaker sex, or that the left side of the brain is the weaker, or that left-handed persons are weaker on that side? "To inquire why the ovary of the right side should have been chosen for the production of boys rather than the other side seems as fruitless and as useless as to inquire why the liver should have been placed to the right and the spleen to the left of the body." Surely this is giving a curious turn to the method of reasoning by analogy. The position of the liver and spleen, as also of the stomach and other viscera, is determined largely by the mechanical factor of pressure under which they mutually adapt themselves to their narrow confines. Originally they also were symmetrically placed with respect to the body axis as are the gonads and kidneys which remain so definitively. With as much reason might one argue that the right eye sees only the upper colors of the spectrum and the left the lower, or that one kidney secretes the mineral and the other the organic matter of the urine or that the right testicle gives rise to blondes and the left to brunettes.

All this, however, has little bearing on the essential point of the theory, which is based upon the following facts and cases: (1) Woman has one-sexed children only by different men; (2) father produces both-sexed children with different wives but only one sex with each wife (in both of these instances the woman is supposed to be unilaterally sterile); (3) man gets both-sexed children with one of his wives but only one sex with the other "because she is unilaterally sterile." If it depended on the male, it is argued, he should get both-sexed children with both wives. The theory is further supported by animals also: (1) cow covered by fifteen bulls has seventeen calves, all female;

(2) mare covered by more than six different stallions had ten foals, all male; (3) bitch covered by two different stud dogs gave birth in two litters to six male dogs; (4) sow gave birth to a litter of ten boar pigs. In all these cases the female is supposed to have been unilaterally sterile. One might urge against the cogency of these facts as supporting the theory that the law of probability and the hypothesis of Mendelian dominance could explain them as well as the supposition of unilateral sterility.

In chapter 8 cases of pregnancy are reported to prove the theory. The proof here consists in showing cases of male and female pregnancy with the corpus luteum in the right and left ovum respectively; six cases of the former are given, and three of the latter (one doubtful). Among the vast number of possible cases, these eight might very well be mere coincidences—for when exceptions occur he invokes the aid of a migration of the ovum.

Chapter 9 considers cases of extra-uterine pregnancy to prove the theory. Twelve cases are reported of tubal pregnancy and a corpus-luteum-bearing ovary on the same side. Accordingly, if pregnancy be in the right oviduct and the fœtus a male, one is justified in declaring the ovum came from the right ovary. Nine such cases are described; and five in which a female fœtus was found in the left oviduct. Furthermore, two cases of twin-pregnancy, one extra-uterine and the other intra-uterine are shown to conform to the rule. Dr. Seligson of Moscow, is said to have collected fourteen cases of males developing in the right tube and females in the left. Two cases of right ovarian pregnancy of male sex are given, and one reverse case.

Chapter 10 takes up cases of pregnancy after unilateral ovariotomy. Five examples of male births after removal of the left ovary are submitted, and four where females were born after the right ovary was removed. A case is reported of right ovariotomy combined with resection of the left ovary, followed by the birth of a girl. Many exceptions are admitted, but they are ascribed to incomplete removal of the ovary in question, or the regeneration of ovarian tissue from the pedicle, or to the presence of an accessory ovary. Thus these examples lose much of their force.

Cases of pregnancy in abnormal uteri are discussed in chapter 11. Seven cases are recorded, four in which the right halves of double uteri were pregnant with males, and three where the left halves contained females. Exceptions, which are frequent, are

charged to a migration of the ovum from one side to the horn of the opposite side. And "in those animals such as pigs, cats, rabbits and mice—whose offspring are truly multiple—the fœtuses are mixed up in the two cornua; but . . . . . the ovaries contain between them a corresponding number of corpora lutea, both individually as regards sex and collectively as regards number" (p. 98).

An interesting presentation is given in chapter 15 of supposed reasons why more boys are born than girls. Statistics recorded for over 200 years show this to be a fact, the proportion being 106 males to 100 females. More boys are said to be born by reason of the greater number of male eggs liberated, and by reason of easier access of spermatozoa to male ova, both due to the anatomical facts above enumerated. Nature thus attempts to compensate for the greater male mortality at birth and during the first five years.

Multiple conceptions are brought under the hypothesis. The woman is held responsible for plural pregnancies; nevertheless the author is forced to admit exceptional cases (p. 144).

In chapter 22 Dr. Dawson attempts to analyze the more obvious objections to his theory. To the criticism that it is too mechanical he answers that all life is essentially mechanical, *e. g.*, respiration, circulation, menstruation. With the fact that the majority of birds have only one ovary, yet the hen lays eggs of both sexes, he has considerable trouble. But he makes argument impossible by simply stating that woman is not analogous to the hen. He seeks support for this contention by citing the fact that birds are asymmetrical in other respects, *i. e.*, absence of right carotid artery and right jugular vein, adding that it is "no more necessary to assume identity between birds and women in the matter of the causation of sex, than in the matter of circulation." It must be pointed out that originally (before hatching) both the circulatory and reproductive systems of birds are identical, at least as concerns bilateral arrangement, with those of the human embryo. It seems more reasonable, on the basis of comparative embryology and physiology, that the human ovaries have an identical, interchangeable and compensatory function just as the kidneys, the testes, the eyes and the ovaries, as respects menstruation, are known to have.

The two concluding chapters deal with the problem of forecasting sex and the production of sex at will. Knowing that the gestation period is 40 weeks and that 13 ovulations normally

occur per annum and that the ovaries normally function alternately, one need know further merely the date of birth and sex of the previous child to compute the sex of the coming child. It is evident that the ovulation in the same months varies in successive years (due to the fact that there are 13 ovulations). From this point then we can work to the tenth month previous to the expected birth. Hence "if children are born in the same month an odd number of years apart they are of opposite sex; if an even number of years intervenes they are of the same sex" (p. 183). Accordingly then the "production of sex at will must consist in avoiding any attempt at fertilization in the months during which an ovum is produced of the sex not desired. Dr. Dawson believes it possible that some day by means of some modification of the Röntgen or other rays, we may actually see an ovary ovulate: At present there appears no way of determining the sex of the first-born.

The book as a whole furnishes entertaining and suggestive reading. One leaves it unconvinced, but stimulated perhaps to test the theory by careful observations of his own clinical materials. One feels, however, that the author is not justified in his extreme position that even higher vertebrates can teach us nothing with respect to the cause of sex and heredity in man. Surely one trained in general biology, especially cytology and comparative embryology can not accept the "theory" as anything more than an unverified hypothesis. Of course the array of clinical facts at first seems to give the theory a semblance of solidity; but this is rapidly dispelled by the arbitrary disposition made of numerous exceptions. By the same methods it would probably be as easy to prove the reverse position, *i. e.*, that females come from the right ovary and males from the left. The problem of sex can never be solved by the method of collecting clinical materials alone—and Dr. Dawson's book represents perhaps the last effort at such a solution. Clinical materials will always be valuable adjuncts, but the essence of sex resides probably as much in the male gametes as in the female, and its final elucidation seems indicated along the lines of a cytological (chromosomal?) interpretation of Mendelian phenomena.

H. E. JORDAN.